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# THE VICTAULIC PIPE JOINT

## By Thorndike Saville[1]

Late in 1919 the writer had an extended interview in London with Dr. Hele-Shaw, a noted English hydraulic engineer. Dr. Hele-Shaw had been engaged by the British Government during the war and in conjunction with L. Tribe had devised a special form of joint for use on pipes and cylinders containing gases and chemicals under very high pressures. After the war it occurred to the inventors of this joint that it was equally applicable to general commercial use for conveyance of water, oil and other liquids. The writer saw the investigations being carried on with this end in view and received permission to be the first to describe it for the benefit of the engineering profession in the United States.

There was much unexpected delay in developing the process of manufacture of the joint so that, in addition to its manifest structural advantages, it could compete in price with other forms of pipe joint. During the past month (May, 1922) the writer has been informed by Dr. Hele-Shaw's associates that this joint is now being produced on a commercial basis, and may be brought to the attention of American engineers and water works officials.

A cross section of the simplest form of joint is shown in figure 1 and a photograph of a joint for 3-inch pipe on the right in plate 1. Basically, the joint is a development of the "U" washer or packing, but eliminates the tendency of this type of water seal to leak at low pressures by uniting the two outer lips. Moreover, the inner lips are of slightly less diameter than the outside of the pipe and hence exercise an initial grip on the ends of the pipes as they are placed in the joint, preventing leakage at low pressures. Then, as water or other pressure is put on the pipe the initial grip of the inner lips increases, the tension becomes compression, and the greater the pressure on the pipe, the tighter the joint becomes.

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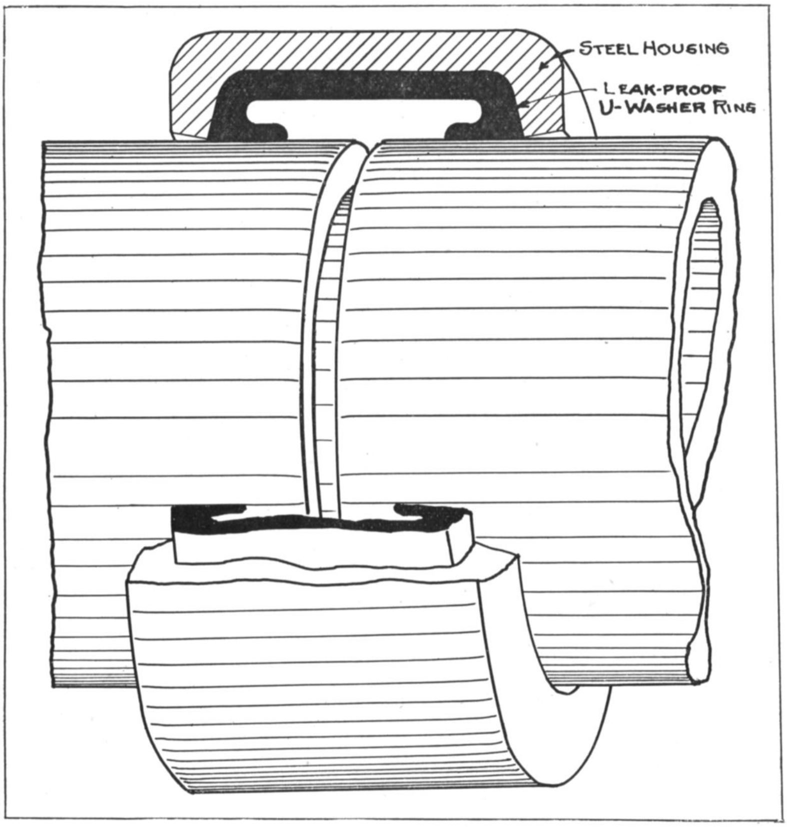

FIG. 1 VICTAULIC JOINT, IN SIMPLEST FORM

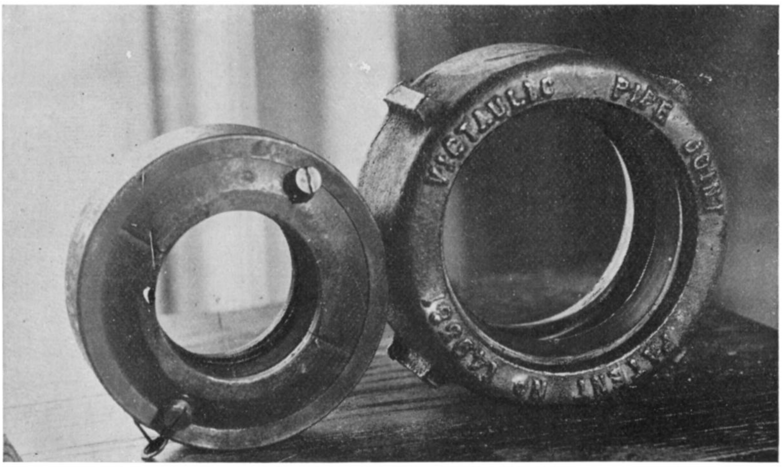

PLATE I

The joint consists of a cast iron or cast steel housing, containing the leak proof washer or ring. When used on water pipes, the material of the inner ring is india rubber, which has been found to be practically indestructible when kept wet and protected from light. When used on pipes carrying steam, gasoline, oil, chemicals, corrosive gases, etc., a special material called "Victaulite" has been developed, which has proved extremely durable under the most rigid tests. Indeed, with true British thoroughness, the inventors have kept this joint off the market for two years, until this material could be perfected and the joint rendered suitable for all purposes.

It is stated that the joint is also proof against leakage from the outside in the event of a partial or total vacuum on the inside of the pipe. This arises from the fact that the end walls of the leak-proof ring are set at an angle, forming a frustrum of a cone. This buttressed end wall, in tending to deflect under an internal vacuum, exercises an increasing grip on the pipe in precisely the same manner as the inner lip acts under a positive pressure, and prevents the ingress of fluids or gases from the outside.

For ordinary pressures up to 300 pounds per square inch, where pipe is buried in ground or otherwise fixed to prevent movement, the type "A" joint shown on the right in figure 1 is used. The pipe needs no preparation or special casing such as a bell, but consists simply of a straight uniform cylinder. Where pressures are greater or where it is desired to secure the joint positively against end displacement under pressure, the type "B" joint is recommended by the makers. This is shown in figure 2 and on the left in plate 1. These joints are normally for use up to 650 pounds per square inch pressure. For very high pressures, up to 2500 pounds per square inch the type B joint is modified somewhat, and ends of the pipe are recessed to hold the leakproofed ring. Another modification of the joint permits great flexibility over that inherent in the normal type A or B joint. While type A joint is simply slipped on over the ends of the pipe, type B joint has to be assembled in place. Plate 2 shows type B joint unassembled. The Victaulic joints have been adapted to a great variety of purposes, such as all kinds of iron, steel and concrete pipe (see figure 3); the heads of collapsible barrels and cylinders, gland rings, etc. The joints are now produced in quantity in sizes to fit pipe having outside diameters from 1 to 24 inches. Larger sizes have to be specially made at present.

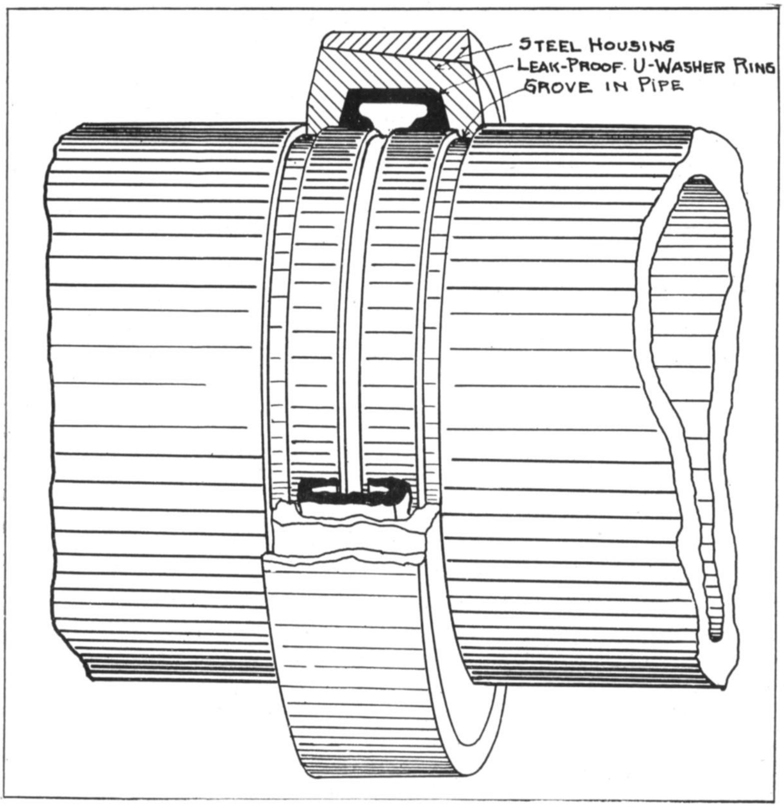

Fig 2. Victaulic Joint—Adapted to Prevent Movement of Pipe

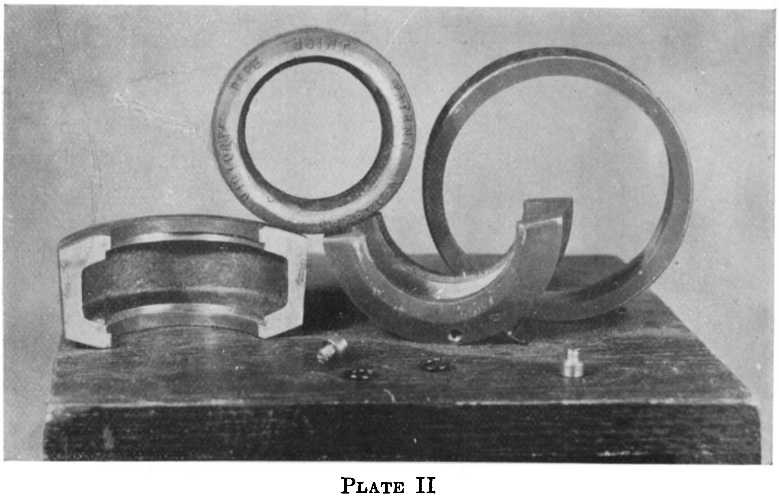

Plate II

Advantages claimed for the "Victaulic" joint are:

1. Eliminates additional expense of casting bells on ordinary cast iron bell and spigot pipe. It lends itself particularly to use on centrifugally cast iron pipe, enabling this to be cast without the single bell form now necessary.

2. Eliminates cost of machining on various patented forms of pipe and pipe joint.

3. Eliminates cost of materials, labor and time incident to making ordinary lead or compound joint. The Victaulic joint may be placed on two pipes in about two minutes, by unskilled workmen. It may be placed on large pipe nearly as quickly and easily as on small pipe.

4. Eliminates additional excavation needed for bell holes in ordinary pipe. Saves much space in piping installations in tunnels, buildings and ships, since room for calking does not have to be allowed, and access to only one side of pipe is necessary.

5. The Victaulic joint has a high degree of flexibility, and especially in water pipe, where the leak-proof ring is of india rubber, the pipe may be several degrees out of alignment, may be subject to repeated vibration or lateral movements without causing leakage. Similarly, the tightness of the joint is unaffected by expansion or contraction of the pipe material. No expansion joints are necessary.

6. There is a material saving in weight, and consequently in freight, over the ordinary forms of pipe and joint. This is particularly the case as the size of pipe or pressure increases.

7. When it becomes necessary to remove a length of pipe, it is only necessary at most to slip back two joints. Cutting of the pipe, fitting of the sleeve, etc., are eliminated, saving time and expense.

8. The joint is absolutely leak-proof, under high or low pressure or vacuum.

9. Trouble from electrolysis is reduced, since current will not leave pipe at joint, but will continue over metal housing.

10. On temporary pipe lines, laid on surface of ground, no alignment of pipe or ground is necessary, since flexibility of joint makes pipe conform to surface irregularities. This increases speed in laying and reduces cost.

Due to the great care taken by Dr. Hele-Shaw and his associates in working out the details of the Victaulic joint, it has been on the market only about a year. Up to within about a month the cost of the joint itself has been so high that it could not compete in local

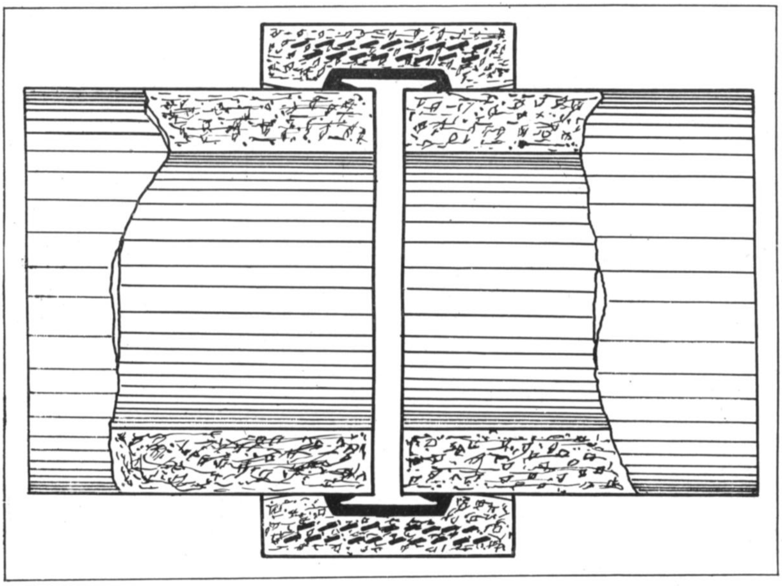

Fig. 3. Victaulic Joint for Concrete Pipe

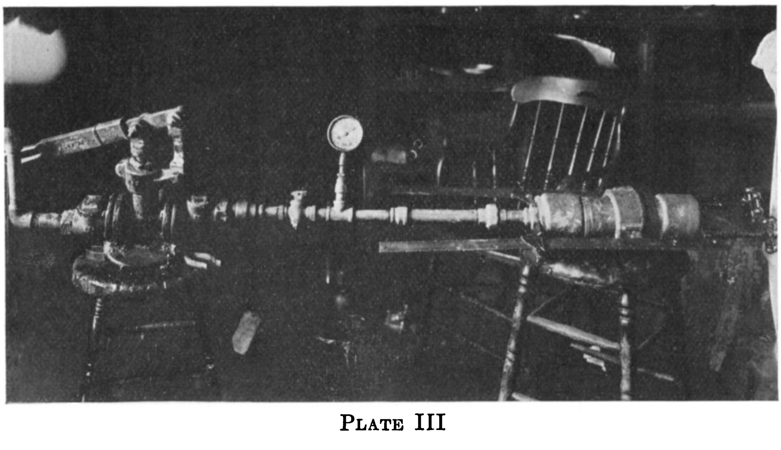

Plate III

installations with the ordinary pipe joints, except where specially severe conditions made the extra expense of the superior Victaulic joint worth while. So far as the writer is aware, the joint is not yet manufactured in the United States, but quantity production has been reached in England and the principal pipe manufacturers are making pipe adapted to this joint. The cost of the joint in England is now where it may compete in first cost with other types of joint, and several installations are being made. For particular conditions and special conditions such as cited above, numerous installations have already been made.

The joint has been subjected to many tests in England, both by the manufacturers and others. Colonel Davidson, Chief Engineer of the Liverpool Corporation Water Works has written the writer that he has "subjected the joint to all manner of tests in our testing shops, with satisfactory results." Through the courtesy of Dr. Hele-Shaw, two sample joints were sent the writer and have been tested by him. A photograph of the type "A" joint under test pressure of 140 pounds per square inch is shown in plate 3. The joint was flexible at this pressure and did not leak. Tests were made at the shops of the Durham Water Works, through the kindness of the Chief Engineer, Captain John C. Michie.

In England, installations of the pipe lines with the Victaulic joint have been made at Dartford on a 16-inch sewage line, and at London on a 6-inch hydraulic force main at 750 pounds per square inch pressure. A number of oil lines have been fitted with this type of joint. The Metropolitan Water Board of London have authorized the use of it for trial on 500 feet of a new water line.

The writer is indebted to Dr. Hele-Shaw for calling his attention to this new type of pipe joint and for arranging with his associates and the Victory Pipe Joint Co., Ltd., the makers of the joint, to supply additional data and samples for testing.